

NEVARC NEWS

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North East Victoria Amateur Radio Club

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An affiliated club of the Wireless Institute of Australia

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VK3ANE



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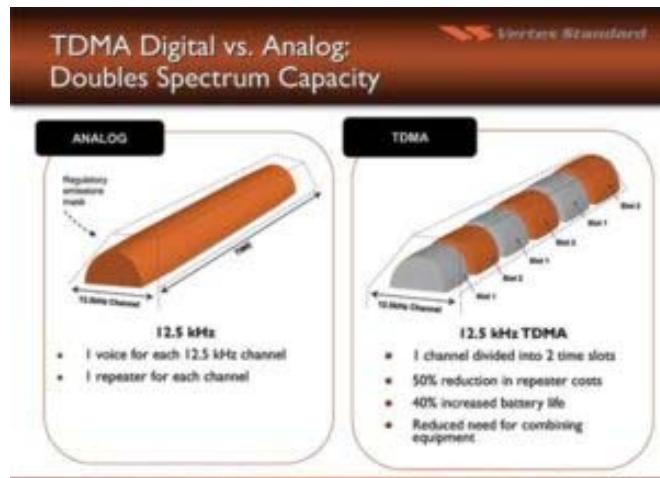
Next meeting to be advised
Members will be emailed of details
Or check the club website



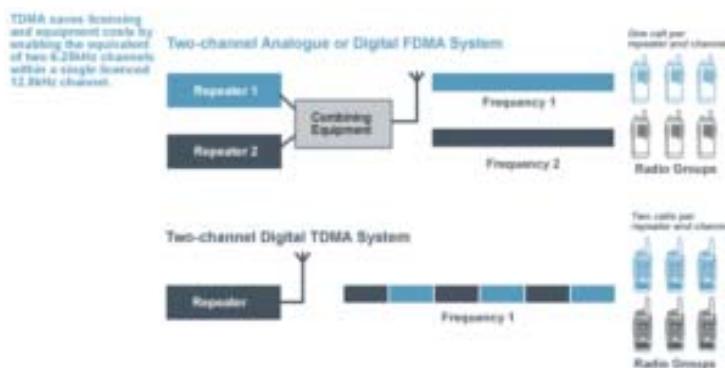
Last meeting had a very interesting and full of live demonstrations of Digital Mobile Radio

Digital Mobile Radio

Digital Mobile Radio (DMR) is a land-mobile radio network standard developed by the European Telecommunications Standards Institute (ETSI). DMR is used by thousands of professional land-mobile radio networks worldwide. A wide variety of DMR mobile, base and portable equipment is available from numerous manufacturers. DMR uses Time Division Multiple Access (TDMA) to provide two 30 ms “slots” per 12.5 kHz radio channel. Each slot can carry independent voice conversations – this means that each DMR repeater provides two simultaneous voice channels – illustrated in the diagrams below:

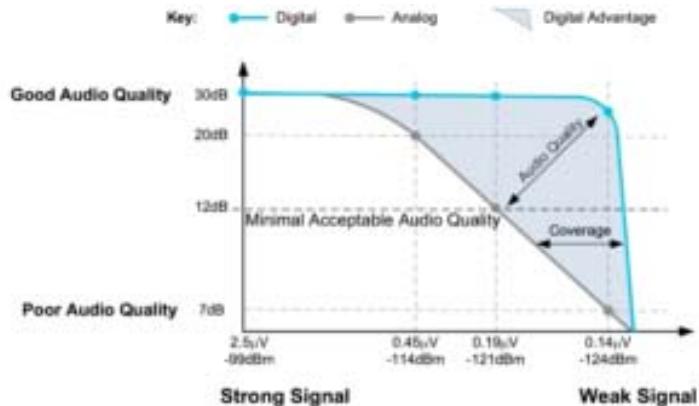


Analogue vs. TDMA (courtesy Vertex Standard)



Two channel analogue/FDMA vs. TDMA (courtesy dmruk.net)

Each slot can also have an almost unlimited number of “talk groups” – these function as discrete channels within that slot. Users on one talk group will not hear those on another. DMR provides better noise rejection and weak signal performance than analogue systems by using advanced Forward Error Correction (FEC) and codecs to remove noise and reconstruct signals that would otherwise be lost – depicted in the following diagram:



DMR vs. analogue weak signal performance (courtesy Tait Communications)

The VK DMR network

One of the great advantages of DMR is that repeaters are designed to be linked together directly via IP. This allows interconnection of repeaters in the next suburb, or on the other side of the world...

A number of DMR system designers who were also amateurs realised the potential offered by DMR for wide area connection of amateur repeaters. They formed a world-wide network of more than 500 interconnected DMR repeaters, across 44 countries, including Australia and New Zealand. There are more than 60,000 registered amateur DMR users.



VK4RBK

Australian DMR amateur repeaters are located in most States/Territories.

All operate in the 438/9 MHz (70cm) UHF band, apart from Brisbane, which also has a 2m (147 MHz) repeater.

VK DMR REPEATERS Black = on the air

Blue = coming soon

<i>QTH</i>	<i>Callsign</i>	<i>Tx freq and rx offset (MHz)</i>
Cairns	VK4RDU	438.025 -7
Atherton	VK4RBK	438.9375 -7
Noosa Heads	VK4RSL	438.175 -5
Sunshine Coast	VK4RNX	438.8875 -7
Mt. Mowbullan	VK4REG	439.9875 -5
Toowoomba	VK4RTQ	439.4875 -5
Ipswich	VK4RBX	438.8375 -7
Brisbane	VK4RMC	439.975 -5
Brisbane	VK4RMC	147.225 -1.6
<i>Logan</i>	<i>VK4RLU</i>	<i>439.875 -5</i>
Nth Gold Coast	VK4RBT	438.7125 -7
Gold Coast	VK4RGX	438.8125 -7
Grafton NSW	VK2RCV	439.9125 -5
Sydney north – Dural	VK2RRW	438.1 -5

Sydney – northern beaches **VK2RMB** 438.4 -5.4

Sydney – Chatswood	VK2RHT	438.350 -5.4
Sydney CBD	VK2RCG	439.5 -5
Sydney south – Engadine	VK2RLE	438.425 -5
Orange	VK2RAO	438.725 -5
Mittagong/High Range	VK2RHR	439.9 -5
Goulburn	VK2RGN	438.325 -5
Canberra	VK1RBM	438.8125 -7
Mt. Wombat	VK3RGV	438.9 -7
Kilmore	VK3RPT	439.525 -5
Mt. Buller	VK3RZU	439.675 -5
Mt. Macedon	VK3RMM	439.825 -5
Mt. Cottrell	VK3RPS	439.725 -5
Melbourne CBD	VK3RSU	438.1 -5.4
Mornington Peninsula	VK3RTE	438.9125 -7
SE Melbourne	VK3RMC	439.375 -5
Geelong	VK3RGL	439.5 -5
Launceston	VK7RAA	438.4125 -7
Hobart	VK7RCR	438.525 -5
Adelaide	VK5RSF	438.8375 -7
Perth	VK6RRR	438.2 -5
Perth	VK6RLM	438.525 -7
Perth	VK6RLX	438.150 -5.4
Perth	VK6RPT	438.025 -5
Perth	VK6RDM	439.8625 -5
<i>Kalgoorlie</i>	VK6RGF	<i>438.125 -5</i>

Using DMR RADIO ID

Each radio used on the DMR network is programmed with a unique user ID number.

You MUST register your radio for it to work correctly.

ID numbers are managed centrally, and may be obtained [here](#).

The user ID database may be found [here](#).

TRANSMIT AUDIO LEVELS

Some equipment tends to have over driven audio on TX – it is very important that you check your transmitted audio for the correct level.

Motorola equipment with the latest firmware can be run with audio AGC on.

GPS POSITION

DMR equipment is often fitted with an inbuilt GPS receiver, with the facility to transmit GPS position over the network.

This function is **not supported by the DMR network, and must be OFF**.

COLOUR CODES, SLOTS AND TALK GROUPS

The DMR system uses 15 “colour codes” which function in a very similar fashion to CTCSS tones on analogue repeaters. A radio programmed with one colour code will not be able to transmit on a repeater programmed with another. All Australian DMR amateur repeaters use colour code 1. As discussed previously, each DMR repeater has two slots, and each slot has a number of talk groups. In general terms, Slot 1 is used for overseas repeaters and slot 2 is used for VK repeaters. Australian DMR repeaters use the following slots and talk groups – these need to be programmed into your radio.

SLOT 1	SLOT 2
TG1 – worldwide	TG505 – all VK repeaters and dongles
TG13 – worldwide English	TG3800 – all VK repeaters
TG113/123 – User activated – only keys repeaters in the QSO	TG380x – state based TG (x=call area)
TG5 – VK club nets and broadcasts – user activated	TG9 – reflectors
TG8 – keys repeaters in defined groups – i.e. all Sydney, FNQ, all Melb, etc.	
TG9 – keys your local repeater only	
TG133 – DMR+ reflector 4369 (USA)	
TG143 – DMR+ reflector 4404 (UK)	
TG153 – DMR+ reflector 4851 (Pacific)	

The TGs are explained in detail below.

TIME SLOT 1

Time Slot 1 – TG1 = Worldwide calling (keys ALL worldwide repeaters..2 min max QSO) – user activated*

Time Slot 1 – TG13 = Worldwide English calling (keys repeaters in English speaking countries)

Time Slot 1 – TG5 = VK nets – user activated*

Time Slot 1 – TG113 = User Activated English chat channel*

Time Slot 1 – TG123 = User Activated English chat channel*

Time Slot 1 – TG8 = Keys repeaters in defined groups – i.e. all Sydney, all Melbourne, etc. See below.

Time Slot 1 – TG9 = Keys your local repeater only

Time Slot 1 – TG133 = Connects to DMR+ reflector 4369 (USA) – user activated*.

Time Slot 1 – TG143 = Connects to DMR+ reflector 4404 (UK) – user activated*.

Time Slot 1 – TG153 = Connects to DMR+ reflector 4851 (Pacific) – user activated*.

TG1 keys *every* DMR repeater and TG13 keys every repeater in english speaking countries. These channels are normally used as calling channels only.

*User activated TGs are activated by pressing your PTT for about 2 seconds with the TG selected. They time out after about 5 mins.

User activated TGs 113/123 are used as a “chat channel” after a call on TG1, or TG13, to reduce network loading – only repeaters used by those in the QSO are keyed, rather than the entire network. TG5 works in the same fashion – this TG is intended for club nets or broadcasts.

Please QSY to TG113/123 after establishing contact with a DX station on TG1 or 13.

TG8 keys repeaters in defined groups. This TG is programmed for each repeater and can not be changed by users.

The TG8 groups are as follows:

TG8 Group	Repeaters linked
1 – Perth	VK6RPT, VK6RLM
2 – Melbourne and Vic.	VK3RTE, VK3RSU, VK3RMC, VK3RZU, VK3RPS, VK3RPT
3 – Sydney and Orange	VK2RAO, VK2RCG, VK2RLE, VK2RHT, VK2RRW
4 – Sth NSW	VK2RHR, VK2RGN
5 – Tasmania	VK7RAA, VK7RCR
6 – Sth Queensland	VK4RTQ, VK4RNX, VK4RMC, VK4RBX, VK4RBT, VK4RLU, VK4RGX
7 –	
8 – FNQ	VK4RDU, VK4RBK

TIME SLOT 2

Time Slot 2 – TG505 = VK repeaters only (keys all VK repeaters) – this is the main VK talk group – dongles are linked to this TG at the moment (March 2018).

Time Slot 2 – TG3800 = VK repeaters.

Time Slot 2 – TG380x = State/Territory based TG, where x is the VK call area – keys all repeaters in that State/Territory only. Can also be used from another state – use the TG for the state you wish to connect to – i.e. 3802 for VK2, etc. The inter-state link disconnects automatically if there is no activity for 15 seconds.

505 is the national channel. As per normal repeater practice, please leave a break between overs for other stations. If you want to have a long QSO, please QSY off 505.

If 505 is busy:

- TG9 on slot 1 can be used to work another station on your local repeater only.
- TG380x on slot 2 can be used to work a station in your own state or a station in another state.
- TG8 on slot 1 is available for repeaters in a group.
- TG123/113 can be used to connect to another repeater directly.

Time Slot 2 – TG9 = Reflectors. This provides access to the DMR+ network of reflectors.

To access reflectors, your radio needs to be programmed with different TGs for TX and RX to access the reflector and TG9 for tx/rx to use the reflector.

TG5000 checks your local repeater status (or look on line at www.vkdmr.net).

You then use the reflector number you wish to connect to as the tx TG – i.e. TG4400 for ref 4400.

Once you have connected, use TG9 for tx and rx to QSO via the reflector.

TG4000 is used to disconnect your repeater from the reflector, or you can just let the reflector time out – they will drop in 15 mins if not used.

There are two ways to program your radio to access reflectors:

1. Program separate channels; or
2. Use your radio's keyboard.

To use method 1 – program the following channels on slot 2:

Channel 1 – TG5000 tx, TG 9 rx to check status

Channel 2 – TG4xxx tx (required reflector number), TG9 rx

Channel 3 – TG9 tx and rx for working the reflector

Channel 4 – TG4000 tx, TG9 rx to disconnect

Method 2 – using the keypad – is a lot simpler – you only need to program one channel:

Channel 1 – TG9 tx and rx.

Use your keypad to enter 5000, the reflector number and 4000 as required.

TG13, TG5, TG505 and TG3800 and TG380x (for your State/Territory) are on permanently – they are not user activated.

DMR equipment

Unlike other amateur digital radio systems, DMR equipment is available from a number of manufacturers, with features ranging from the very simple to comprehensive.

Prices start from \$100-150.

DMR equipment is designed for commercial use – it is rugged, durable, reliable and has high RF specifications.

The TDMA protocol used in DMR also provides up to 40% increase in battery capacity compared to conventional analogue portable radios.



DMR portables (pic courtesy Manx Repeaters)



DMR mobile installation

Mobile and portable equipment is produced by the manufacturers listed below. Some manufacturers may offer competitive pricing, provided the equipment is used exclusively for amateur radio.

There is also quite a lot of second hand equipment available on eBay and similar sites.

Commercial DMR use is growing rapidly, and many manufacturers are entering the market – particularly from China.

Accordingly, the list below may not be exhaustive.

DMR MANUFACTURERS (E AND OE)

Motorola

Hytera

Connect Systems

Simoco

Kenwood

Puxing

Sepura

Vertex

Tytera

Tait

Radioddity VHF/UHF dual band

Tier 1 is a license free digital radio platform

Tier II is digital a conventional radio platform

Tier III is digital trunked radio platform

DMR Tier I products are best suited for personal recreational use and other settings that do not require wide area coverage or an advanced radio feature set. These radios were designed for license-free use in the 446 MHz band, known in Europe as the PMR446 band. They utilize a maximum of 0.5 Watt RF power output with fixed/integrated antennas, no use of repeaters or telephone interconnects DMR Tier I devices are not suitable for emergency use or business applications as there are a limited number of channels and usage is on a first-come-first served basis.

DMR Tier II was developed for the sole purpose of replacing conventional analog two-way radio systems with a pin-to-pin digital solution, meaning the digital system should perform the same with regard to coverage and application. This includes the use of a single site repeater or a multisite network of repeaters just as the previous analog two-way radio network had. The designers of DMR opted to use a two slot Time Division Multiple Access (TDMA) as the underlying technology for this standard.

DMR Tier III was the logical next step for this two slot TDMA technology.

A trunked radio network makes use of several repeaters all on different frequencies within the same band operating together under computer control to allow the pooling of resources for several agencies or organizations. Typically a control channel integrates the intelligence required to organize and administer the radio fleet.

Utilizing DMR Tier III the capacity increases and many additional features are far easier to implement than on a conventional or simulcast system. These digital trunked networks deliver feature rich mission-critical communications over wide geographic areas.

Benefits of DMR vs analogue

1. Open standard

DMR is an open standard which is not proprietary to any single manufacturer. The DMR standard specifies that DMR equipment must be compatible, so a radio will work on any base station or network, which improves availability of options and pricing.

2. Louder and clearer audio

The microphone in analogue radios relay every sound but DMR gives you crisper, clearer audio with less background noise, static or distortion because it converts voice information into digital data. A smart new feature in DMR is intelligent audio, which adjusts radio volume to fit an environment's noise level. For example, the radio automatically boosts the volume level when the truck drives up, but reduces again after the truck passes.

Of course, loud audio is useless if audio quality is poor, so DMR radios contain innovative signal processing algorithms to help actively manage distortion. This means that the buzz that comes when a listener increases the mobile radio's audio volume is nearly eliminated. After the signal is processed and the background noise is removed, speech is transmitted more effectively for clear and intelligible communications. Built-in error correction eliminates static and ensures voice calls are heard clearly.

3. Double the capacity

DMR immediately doubles the capacity of an existing 12.5 kHz channel with time division multiple access (TDMA) technology. While a regular analogue two-way radio system uses an entire 12.5 kHz narrowband channel to provide a single talk path, a DMR digital radio system supports two simultaneous and independent calls over the same channel. The result is double the channel capacity of the radio system, also enabling independent and private talk groups.

4. Better coverage

DMR potentially provides better coverage, whether across a single or a multisite operation. As signal strength decreases digital mobile radios have more range than analogue, as audio quality is maintained up to the edge of the coverage area.

5. Data capabilities

One of the greatest benefits of DMR is integrated voice and data capabilities. Applications (apps) such as GPS location, SCADA, text messaging, telemetry, radio programming, job ticketing and enhanced safety features extend DMR two-way radios well beyond merely voice communications.

Radio systems can also be integrated into line-of-business applications such as computer aided dispatch (CAD) and work order management. Apps such as WAVE Work Group Communications even enable DMR users to communicate when people are on different devices or networks.

6. Advanced control features

The DMR standard utilises the second time slot (TDMA) for reverse-channel signalling. While the first channel is in a call, instructions are sent to the radio via the second time slot channel. This enables priority call control, remote control of the transmitting radio or emergency call pre-emption, giving the radio system operator a high degree of control and flexibility.

DMR offers a high degree of control over system requirements, such as design, priorities, features, caller ID and operation, allowing configuration of a system for a specific environment.

7. Battery life

Digital technology is much more energy efficient than analogue, because DMR technology uses the transmitter of the radio only half the time in comparison with narrowband analogue radio due to TDMA. So the drain on the radio's battery is reduced by nearly 50 per cent, increasing available talk time between charges and enabling longer communications on a single charge.

8. Compatibility with legacy systems, easy migration

DMR has backwards compatibility with legacy radios or analogue systems if required, for example, to maintain compatibility with an onsite contractor. Furthermore, as digital radios work in either analogue or digital mode, migration can be achieved one radio or channel at a time, or by switching out the whole system at once. The output spectrum fits into the existing 12.5 kHz narrowband FM channels used by legacy analogue systems, making migration much simpler.

9. Security

Protecting your privacy is easier with DMR, with encryption and authentication whereby the radios exchange a key with the system prior to operation. Such features make it harder for others to listen in on a frequency, so communications stay private.

10. Cost

DMR systems provide predictable costs, with no additional airtime fees such as those associated with mobile phones.

11. Lighter devices

In industries such as hospitality or security, the size and discreetness of a radio is of utmost importance. Ultra-thin, ultra-light digital mobile radios provide all the benefits of DMR with a smaller, lighter design, allowing users to discreetly provide superior customer service.

President, VK2VU, Gary
Vice President, VK3CM, Brenton
Secretary, VK2FKLR, Kathleen
Treasurer, Amy



NEVARC CLUB PROFILE

History

The North East Victoria Amateur Radio Club (NEVARC) formed in 2014. As of the 7th August 2014, Incorporated, Registered Incorporation number A0061589C. NEVARC is an affiliated club of the Wireless Institute of Australia.

Meetings

Meetings details are on the club website, check for latest scheduled details.
Meetings held at the Belvoir Guides Hall, Silva Drive West Wodonga.

VK3ANE NETS

HF

7.095 MHz Monday, Wednesday, Friday - 10am Local time
3.622 MHz Wednesday - 8.30pm Local time

VHF

VK3RWO Repeater 146.975 MHz – Monday - 8pm Local time
All nets are hosted by Ron Hanel VK3MRH (soon to be VK3ARH) using the club callsign VK3ANE

Benefits

To provide the opportunity for Amateur Radio Operators and Short Wave Listeners to enhance their hobby through interaction with other Amateur Radio Operators and Short Wave Listeners. Free technology and related presentations, sponsored construction activities, discounted (and sometimes free) equipment, network of likeminded radio and electronics enthusiasts. Excellent club facilities and environment, ample car parking.

Website: www.nevarc.net.au

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All editors' comments and other opinions in submitted articles may not always represent the opinions of the committee or the members of NEVARC, but published in spirit, to promote interest and active discussion on club activities and the promotion of Amateur Radio. Contributions to NEVARC News are always welcome from members.

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Please include a stamped self-addressed envelope if you require your submission notes returned.

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Attachments of (or thought to be) executable code or virulently affected emails will not be opened.

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Any dates, times and locations given for upcoming events please check with a reliable source closer to the event.

This is particularly true for pre-planned outdoor activities affected by adverse weather etc.

The club website www.nevarc.net.au has current information on planned events and scheduled meeting dates.

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